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TORREYA

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SOME FLORAL FEATURES OF MEXICO*

By H. H. RUSBY

At a rough estimate, two thirds of Mexican territory is arid, and nearly half of this can be considered a desert, in that it cannot naturally support grazing animals.

The fertile region includes (1) the lowland of the south, with a tropical climate, and amidst which there are numerous mountains possessing a subtropical, or some of them even a temperate climate, and which gradually changes into an arid region as it rises into the central table-land; (2) an eastern or Gulf Coast strip which, gradually narrowing, extends from the southern tropics clear up into Texas; (3) a Pacific Coast strip which, narrow at all points, gives way northward to the desert region of and adjacent to the Peninsula of California.

Within these boundaries, and stretching to the Rio Grande, is the arid region, of which more than the northern half, and especially the northwestern portion, is a real desert.

This, with the exception of its western part, is the region best known to tourists and visitors, for the reason that the main lines of travel run directly through it from north to south. It presents the same general aspect as the country through which the Southern Pacific Railroad runs from western Texas to Los Angeles. If one passes through it toward the close of the dry season, which extends in its most favorable sections from December to July, and in its most unfavorable ones begins nearly two months earlier; he encounters a region of torrid heat and

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intense dryness, in which every motion stirs up a copious, fine, penetrating dust which keeps one covered as long as he remains in it. At this time, the landscape is almost unvaryingly bare and of various shades of gray, brown and red. Flowers are almost wanting, although this is a favorite blooming time with many cactuses, and there are some other succulents, such as *jatrophas*, which then begin to bloom.

Not only does the period of rains differ greatly in different parts of this arid region, but the amount of rain shows remarkably wide limits of variation. Even where there is but little, a surprising change occurs in the aspect of the country after its occurrence. Within a month, the ground acquires a more or less nearly complete covering of grasses and is carpeted in patches, often large ones, with solid masses of bloom, and the appearance of the surface is abundantly broken by patches of flowering shrubs.

The most conspicuous objects on these plains are yuccas, agaves, flat and cylindrical jointed opuntias, covilleas, *Proso-*

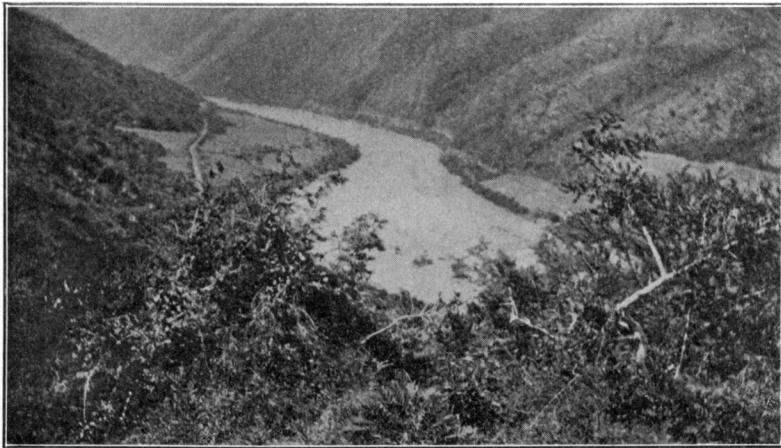


FIG. 1. The Balsas River.

pis, and *artemisias*. The opuntias grow almost everywhere. yuccas of some species are almost as generally distributed,

though the very large and conspicuous ones are confined to certain districts. Agaves are mostly confined to the mountains or rocky places. Of all these plants, the most striking is a giant branching yucca, reaching a height of twenty feet or more, which bears its dense panicles of white flowers, more than a yard in length and two thirds as broad, in a strictly pendulous position. The larger shrubby growth is mostly mimosaceous, consisting of *Prosopis* and *Acacia*, with smaller mimosas and calliandras about their bases.

Very frequently the *Prosopis* attains the dimensions of a good-sized tree, though this more commonly occurs as we are entering the fertile or semi-fertile southern districts. It is very rare that we encounter streams in this region, though arroyos, carrying water in the rainy season, are seen in all directions. In such locations, where there is a water supply not too far below the surface, a fringe of cottonwoods and pepper trees may be seen.

The herbaceous patches of bloom, to which reference has been made, consist chiefly of Compositae, especially *Pectis*, *Actinella*, *Layia*, *Melampodium*, and taller *Baileya*, *Coreopsis*, *Grindelia* and *Gymnolomia*. There are also many tuberous rooted ipomeas and oxalids.

Everywhere in sight are mountains of enormous height, many of their slopes being apparently inaccessible. Their appearance, for the most part, is even more arid than that of the plains, but since they receive much more frequent and copious showers, their upper portions probably possess a rich and interesting flora. It has never been my lot to ascend any of them.

The northwestern desert region I have never visited, and I must say the same of the eastern coast, so that I shall not attempt a description of those regions.

The transition from this desert table land, where the production of cultivated crops without irrigation is impossible and where water for irrigation is not to be had, by any present methods, is of great interest. It must be stated, however, that in some places portions of the desert have been brought under cultivation by means of a water supply obtained either

from rivers or artesian wells, and here the soil has been found of great fertility, so that there is hope of eventually redeeming a large portion of this desert.

The first change noticed, a little more than half-way from the United States border to the City of Mexico, is a more liberal water supply, encouraging extensive tillage by irrigation methods. A little farther south we find that although irrigation is very largely resorted to, it is possible to produce such crops as corn through the unaided agency of the rainy season. The rapidity with which such crops grow and attain maturity at this time is indeed remarkable.

Most of my own field work in Mexico has been performed in this semi-arid region, so that I have had an opportunity to become rather well acquainted with the general features of its

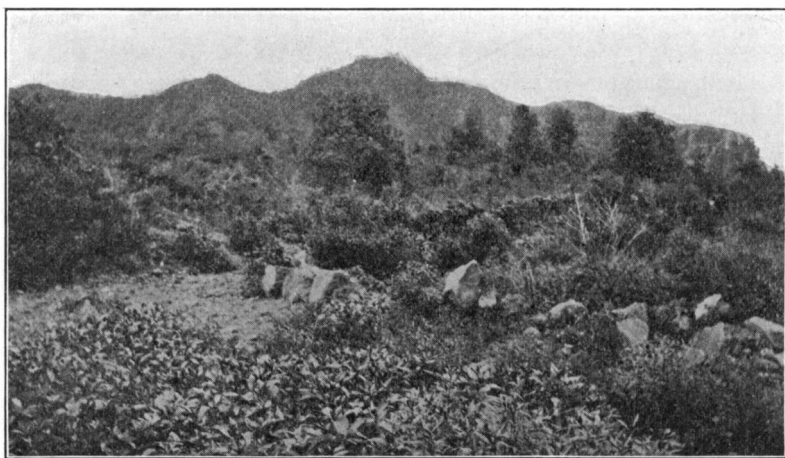


FIG. 2. Lava Beds along Cuernavaca R. R.

flora, while not having found time to determine many of the species encountered. One of the most noticeable sights to the visitor from the north is that of the vast fields of maguey or century plant, used for the manufacture of the fermented beverage pulque and its distillate, mezcal. Its buds, taken just before flowering, resembling huge cabbages and occasionally a hundred

pounds or more in weight, are baked into a sugary mass which is eaten as a sort of sweet conserve. In these cultivated lands, the *Prosopis* becomes a tree, much resembling a spreading oak, or even a large apple tree. These trees are left standing in the cultivated ground and their branches become the support for stacks of hay or other fodder, thus placed out of reach of marauding animals.

In the vicinity of Iruapato, vast areas are devoted wholly to the culture of the strawberry, irrigation by the use of shallow wells being resorted to, and the delicious fruit being supplied throughout the year. The natural aspects of the vegetation here have largely disappeared, owing to the fact that the land is almost wholly cultivated, but in the waste places there is a rich and varied herbaceous and suffrutescent flora. In many places the steep hillsides and narrow valleys are used only for grazing purposes and here there is often a dense covering of large shrubs or small trees. In some places these trees consist largely of junipers, intermingled with *Acacia*, *Prosopis*, *Arctostaphylos* and cotton-woods, while along the edges of the streams the beautiful and often enormous Mexican cypress begins to appear. A specimen of the last-named tree, growing in Oaxaca and called "the Tule," is one of the largest trees in the world. A strange and very showy effect is sometimes produced amidst this arborescent hill growth by the abundance of loranthaceous parasites which it supports. Much of this parasitic growth consists only of *Phoradendron*, and is merely green or yellowish green, but at times the crowns of the trees in all directions will be seen invaded by masses of brightly colored members of this family, the entire mass glowing with brilliant scarlet, crimson or yellow. Sometimes almost the entire crown of a juniper tree will be occupied by such a growth. During the rainy season many of the natural hollows will be converted into pools, sometimes acquiring the dimensions of small lakes. In addition to these natural deposits of water, artificial ones are created by the farmers, wherever there is a sloping surface which can be dyked with mud at its lower boundaries, so that one sees so much water as to create the impression that he is in a country of

marshland. Around the margins of such pools, especially the natural ones, there is frequently seen a broad band of pink or purple *Cosmos*, sometimes a hundred yards or more in breadth and presenting a solid mass of color. Similar patches of yellow *Helianthus*, *Coreopsis* and related genera are abundant.

These are the conspicuous features of the flora, as viewed by one who is passing through it. When we dismount and walk over these hills and through the valleys, our interest centers in the wonderful variety of small annual and perennial herbs, both as to species and larger groups, which crowd into every undisturbed spot.

In the foothills of the mountains of this region, the botanist becomes quite lost in the profusion of unfamiliar plants. The acacias and Prosopids exist in undiminished abundance and, growing among them so thickly as to make travel difficult, are numerous species of *Terebinthus*, or *Bursera*, spiny erythras bearing long moniliform pods showing brilliant scarlet seeds through their half-opened sutures, stinging jatrophas, intricately thorny Rubiaceae and small silk-cotton trees, and all these frequently bound together by twining *Clematis*, *Passiflora*, *Thomaea* and leguminous vines. Many of the smaller shrubs also are leguminous, among them the beautiful *Brongniartia*, with silky-white herbage and lovely dark chocolate-colored flowers. In some places the arborescent growth is almost wholly of the Palo Amarillo rubber-tree, *Euphorbiadendron fulvum*. Extremely varied are the lantanas, their flowers ranging in color from pure white or white with a golden eye, through various shades of pink and purple, even to brilliant orange or vermilion. Almost equally abundant and varied are the species of *Stevia*. Among the herbaceous vegetation, purple flowered *Oxalis* exists in great variety, with many Geraniums, purple flowered ruellias and Nyctaginaceae, and yellow *Tribulus*. Ferns of the hardier kinds, such as rigid pellaes and notholaenas, are frequent, but not nearly so abundant as farther south. Where the canyons open out into valleys leading to the plains, the Cactaceae comprise the greatest bulk and the most interesting feature of the flora. In places the entire surface over many

acres is so intricately covered with opuntias that travel is slow and difficult. At first sight, and until one has become accustomed to their examination, all seem to be slightly variable forms of a single species, but one presently becomes aware that the variations, however numerous and slight, are constant. If he is then fortunate enough to secure the companionship of a competent and experienced mountaineer, he will learn that all these forms, and more than he has differentiated, are distinguished by names and that the differences between them, such as the shade of green of the surface, the form and relative thickness of the joints, the shade of color of the flowers, their time of appearing and the color, especially the internal color, of the fruits, and their edible properties, are all well defined by the natives. I am strongly of the opinion that the relation between the present state of our knowledge of the Mexican opuntias, and that of the future, is much like that of our knowledge of American *Crataegi*



FIG. 3. *Vitis blanco* Munson.

of ten years ago as compared with that of the present. Some of these flat-jointed opuntias are old and large trees, with trunks two feet or more in diameter. The huge, widely and densely branching *Myrtilocactus* is often conspicuous and abun-

dant. Its small, delicious fruit is an important article of trade, under the name of "Garambulla."

As we approach the valley of Mexico, we come into a more fertile region, producing tropical fruits and other products indicating the rich luxuriance which we are to encounter after another day's journey to the south or east. The mountain flora of the vicinity of Mexico is of special interest and beauty. Here there are many species of *salvia*, *oxalis*, *verbena*, *geranium*, *Solanum*, etc. Terrestrial orchids are decidedly numerous, though scarcely abundant, and the instant that we penetrate to the warm and moist valleys, even quite near to the city, interesting and handsome arboreal species begin to appear. Arboreal ferns, *tillandsias* and other bromeliads are also numerous. In rich places among the rocks dahlias of various colors are common and abundant.

(To be continued)

THE NATURE AND FUNCTION OF THE PLANT OXIDASES

BY ERNEST D. CLARK

(Continued from March Torreya)

FUNCTION OF THE OXIDASES IN THE PLANT

Physiology

It is evident from the preceding chapters that oxidizing enzymes are very widely distributed. Since enzymes generally seem to be produced by plants or animals for some definite purpose in the life of the organism, it was natural that speculation should arise regarding the function of the oxidizing enzymes. Their usefulness to the plant probably lies in their power to act as accelerators of the ordinary processes of oxidation as we shall see in a closer study of their function in the plant.

The oxidases, more especially peroxidase and occasionally oxygenase, are found in seeds and seem to bear some relation